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Role Of Hiv/Aids Duration And Socio-Ecnomic Factors In Vitamin-D Depletion Among Infected Individuals

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Abstract

Objective: To assess socioeconomic status and the duration of HIV/AIDS influence the prevalence and severity of vitamin D deficiency among HIV-infected patients

Method: This cross-sectional study was conducted in the Department of Public Health at the University of Lahore Teaching Hospital, Lahore, Pakistan, between March 14, 2023, and April 30, 2024. The goal was to determine how common vitamin D insufficiency was among people living with HIV. With a 95% confidence level and a 5% margin of error, 200 ELISA-confirmed HIV-positive patients were chosen by a non-probability sequential sampling technique. Patients who met our inclusion requirements gave their informed consent, and a questionnaire was completed after their vitamin-D levels were measured in a blood sample.

Results: A total of 200 HIV/AIDS patients were included in this research. There were 60 (30%) women and 140 (70%) men among them. The patients ranged in age from 20 to 60, with a mean age of 45.0±1.0. Of the participants, the majority (82 or 41%) were in the 18–30 age range. In contrast, 52 people (26%) and 56 people (28%) were older than 52 and between 31 and 50, respectively. There were 45 people with low socioeconomic status (22.5%), 114 people with intermediate socioeconomic status (57%), and 41 people with high socioeconomic status (20.5%).

Conclusion: Vitamin D insufficiency is quite common in HIV-positive individuals, it does not significantly correlate with socioeconomic level or length of illness. Given that conventional HIV measures like viral load and CD4 count are not accurate risk indicators, routine screening and prompt investigations for vitamin D levels are crucial. It is advised to take vitamin D supplements, educate patients about sun exposure and dietary sources, and implement national food fortification and public health education programs. Future research should determine suitable cutoff points for 25(OH)D levels and investigate how socioeconomic status and HIV duration affect deficiency rates.

Keywords: Socio-ecnomic status, HIV/AIDS, Vitamin-D

Inroduction:

In children, vitamin D deficiency causes rickets, and in adults, osteomalacia. In children who are able to stand, rickets causes bone deformities in the lower limbs because of delayed endochondral ossification at the growth plates of long bones, while osteomalacia is characterized by impaired mineralization of osteoid on trabecular and cortical bone surfaces, resulting in wider seams and weakened zones. In addition to clinical deficiency, low vitamin D levels have been associated with an increased risk of osteoporosis, cardiovascular disease, diabetes, and tuberculosis [1-2]. Around the world, estimates of vitamin D inadequacy among people with HIV range from 29% to 80%. It is a prevalent anomaly that might function as a stand-alone predictor of HIV progression. Maintaining extra-skeletal and musculoskeletal health, including immune system and cardiovascular functioning, requires the identification, treatment, and management of vitamin D insufficiency [3]. Vitamin D insufficiency has been linked to a number of diseases, including bone abnormalities, in HIV-infected people [4]. According to certain research, people with HIV may have a greater frequency of osteoporosis and osteopenia than those in the general population of the same age and gender. Therefore, it is crucial to address changes in bone metabolism in HIV patients [5–6].

According to published research, people with HIV were also lacking in this vitamin. Less vitamin-D concentrations or amounts were associated with larger or higher cIMT , a metric or indicator of subclinical atherosclerosis, in two recent studies of HIV-infected individuals [7,8]. Amazingly high rates and quantities of the main-circulating metabolite of vitamin D in the general population's blood have been found in recent years. Lack of the vitamin has been linked to all-cause mortality, osteoporosis, CVD, and insulin resistance. HIV infection is associated with a number of variables that may contribute to lower 25(OH) D levels [9]. Therefore, it has become routine practice to regularly check for low levels of 25(OH) D and to supplement those who do not get enough of it. According to the Institute of Medicine, taking this vitamin orally on a daily basis up to 2000–4000 international units is safe[10]. Vitamin-D deficiency was also found in 107 out of 121 HIV-positive individuals (88.4%), according to one study[11]. Income is only one aspect of socioeconomic status (SES); other factors include social class, subjective assessments of social position, educational attainment, and financial stability. In particular, poverty is a complex problem marked by a variety of psychological and physical pressures. Across the lifespan, SES is a constant and accurate predictor of a number of physical and mental health outcomes. HIV is directly linked to social and economic injustices both locally and internationally, as it disproportionately affects those from lower socioeconomic backgrounds. Socioeconomic position has been shown to affect an individual's chance of contracting HIV. Furthermore, the quality of life for those infected with the virus is significantly influenced by socioeconomic status [12]. Likewise, one of the best indicators of vitamin-D inadequacy is socioeconomic status. One significant factor contributing to vitamin-D shortage is household income. Families with lower incomes are more likely to experience vitamin-D scarcity than those with higher incomes because they cannot afford fortified foods and dietary supplements [13]. Lower socioeconomic status was also linked to a higher incidence of vitamin-D deficiency in Chinese women, according a recent study [14]. Assessing blood levels of 25-hydroxyvitamin D [25(OH)D] is one way to determine vitamin D sufficiency. A number of vitamin D supplementation studies and an Institute of Medicine (IOM) comprehensive review [15] have suggested that blood 25(OH)D levels should be maintained between 50 and 100 nmol/L (20–40 ng/mL), while others advocate a range of 75 to 125 nmol/L (30–50 ng/mL). It is now believed that the range of 75–100 nmol/L (30–40 ng/mL) is well recognized. A 25(OH)D level of less than 20 ng/mL is deemed inadequate for bone health. Vitamin D deficiency is defined in this study as a serum 25(OH)D level of less than 50 nmol/L. Mostly based on studies about bone health, the IOM advises keeping levels above 50 nmol/L (20 ng/mL) [16]. Furthermore, in order to lower the risk of fractures and falls, groups like the American Geriatric Society (AGS), the National Osteoporosis Foundation, the International Osteoporosis Foundation (IOF), and the Endocrine Society recommend that older adults maintain a minimum 25(OH)D level of 75 nmol/L (30 ng/mL) [17]. The objective of this study was to assess how socioeconomic status affected vitamin D insufficiency in clinical patients with HIV.

Methodology

This cross-sectional study was conducted in the Department of Public Health at the University of Lahore Teaching Hospital, Lahore, Pakistan, between March 14, 2023, and April 30, 2024. The goal was to determine how common vitamin D insufficiency was among people living with HIV. With a 95% confidence level and a 5% margin of error, 200 ELISA-confirmed HIV-positive patients were chosen by a non-probability sequential sampling technique.Patients who met our inclusion requirements gave their informed consent, and a questionnaire was completed after their vitamin-D levels were measured in a blood sample. According to an operational definition, those with vitamin-D levels < 50 nmol/l (20 ng/ml) were deemed vitamin-D deficient.Those with vitamin-D deficiencies were treated in accordance with hospital guidelines.Participants were divided into three socioeconomic classes: Low, Middle/Average, and High class .The collected data was input into SPSS v23.0 and examined for findings and descriptions. Factors such as SES, vitamin D insufficiency, and gender were expressed as percentages and frequencies. Age, gender, and socioeconomic level were used to stratify the data. Chi-Square testing was used for post-stratification, with a p-value of less than 0.05 considered significant.

Results

A total of 200 HIV/AIDS patients were included in this research. There were 60 (30%) women and 140 (70%) men among them. The patients ranged in age from 20 to 60, with a mean age of 45.0±1.0. Of the participants, the majority (82 or 41%) were in the 18–30 age range. In contrast, 52 people (26%) and 56 people (28%) were older than 52 and between 31 and 50, respectively. There were 45 people with low socioeconomic status (22.5%), 114 people with intermediate socioeconomic status (57%), and 41 people with high socioeconomic status (20.5%).Table 1

Table 1: Socio-Demolgraphic Chracters

Variables	Category Name	Frequency	Percentage (%)
Gender	Male	140	70
	Female	60	30
Age	18-30 years	82	41
	31-50 years	56	28
	>51 years	52	26
Socio-Ecnomic Status	<20,000 PKR	45	22.5
	21,000-50,000 PKR	114	57
	>51,000 PKR	41	20.5

A chi-square stratification of vitamin D insufficiency by socioeconomic status revealed a negligible difference between the two variables (p=0.070).Table 2

Table 2: Vitamin-D Deficiency with socio-ecnomic status

Socio-ecnomic status	Vitamin-D deficiency		Total	P-value
	Yes	No		
<20,000 PKR	28(62.2%)	17(37.8%)	45(100%)	**0.070**
21,000-50,000 PKR	85(74.6%)	29(25.4%)	114(100%)	
>51,000 PKR	22(53.7%)	19(46.3%)	41(100%)	
Total	**135(67.5%)**	**65(32.5%)**	**200(100%)**	

Discussion

Vitamin-D also plays a function in slowing the advancement of HIV disease and preventing death due to its extensive engagement and contribution throughout the whole immune system, even in patients starting antiretroviral medication (ART). The optimal vitamin D status is indicated by blood concentrations of 25-OHD of 75 nmol/l (30 µg/l) and above;

in this study, we utilized a level of vitamin D of ≤50 nmol/L to indicate dearth or shortage [18].In this study, 67.5% of participants had low levels of vitamin D. In line with the proportion reported in our investigation, another study conducted on 1077 HIV-positive individuals in the southern part of London indicated that 73.5% of them had vitamin D deficiency (<50 nmol/L) [19]. According to the findings of another study, 67% of people had vitamin-D deficiencies (<50 nmol/L), which is consistent with our findings [20]. Our findings are consistent with another study that found that 80% of infected individuals had inadequate vitamin D [21]. The prevalence of low vitamin D in people with HIV varies from 24 to 72 percent in various topographical locations, age groups, and climates [22]. In another study, 60.2% of participants had a shortage of the aforementioned vitamin, and the blood mean for 25(OH) D was 20.7 ng/mL. Aside from vitamin D, pathological conditions can also result from inadequate consumption of calcium and phosphorous[23]. Vitamin D insufficiency was detected in 107 out of 121 HIV-positive people (88.4%) in a Belgian research [11]. Another research found that non-white ethnic groups had a greater incidence of vitamin D insufficiency and that the spring and winter seasons were associated with higher rates of deficiency [24]. Lower socioeconomic status (SES) has been associated with lower dietary and supplementary vitamin D consumption, as well as decreased outdoor exposure and physical activity, all of which diminish UVB exposure. People in underprivileged regions were over twice as likely to be vitamin D deficient as people in wealthy areas [25]. According to Zhang et al., who also found an insignificant association between SES and vitamin D deficiency, our study's chi-square test showed no statistically significant difference between socioeconomic status and vitamin D deficiency (p=0.070). These findings are consistent with previous research that suggests that although low SES may independently increase the likelihood of severe vitamin D deficiency, its overall impact on deficiency rates remains complex. Another study also found no difference in the prevalence of vitamin D deficiency between those with below- and above-average SES (P = 0.876) [26].

Conclusion

Vitamin D insufficiency is quite common in HIV-positive individuals, it does not significantly correlate with socioeconomic level or length of illness. Given that conventional HIV measures like viral load and CD4 count are not accurate risk indicators, routine screening and prompt investigations for vitamin D levels are crucial. It is advised to take vitamin D supplements, educate patients about sun exposure and dietary sources, and implement national food fortification and public health education programs. Future research should determine suitable cutoff points for 25(OH)D levels and investigate how socioeconomic status and HIV duration affect deficiency rates.

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